



IN REPLY REFER TO:

United States Department of the Interior

GEOLOGICAL SURVEY
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DENVER FEDERAL CENTER
DENVER, COLORADO 80225
Office of Energy and Marine Geology
Branch of Sedimentary Processes



February 3, 1989

Mr. Randy Heuscher
Utah State Office
U.S. Bureau of Land Management
324 South State Street
Salt Lake City, Utah 84111

Dear Randy:

Enclosed is our proposal to evaluate the oil-shale resources in the eastern part of the Uinta Basin, Utah in support of your proposed exchange of state lands for the Federal Ua-Ub lease tract.

As you will note, five geologists were selected for the project each of whom will have certain tasks as outlined in the proposal. Because these people have considerable geologic knowledge of the oil shale lands and skills in resource evaluation techniques--and working with the Geological Survey's computer facilities and available oil-shale programs--the project should be completed in a much shorter time than would otherwise be possible.

The total cost of the project is estimated at \$51,013. This does not include travel expenses that may arise during the course of the work. The proposal includes enough time to evaluate the oil-shale resources of the Federal Ua-Ub tract utilizing all of the core hole information (about 27 core holes) that is available. Purchase of some computer equipment and software is included in the proposal.

I estimate that 90 working days will be required to complete the study. We will be ready to start the project as soon as it is approved. We may experience some delays in obtaining some well logs and analytical data. We have some data for the Gulf core holes drilled on and near the Ua-Ub tract but little or no information for the X- and P-series holes that were drilled later by the Ua-Ub operator. We will also probably need to acquire some logs for oil and gas tests drilled in the study area either from the State of Utah, or perhaps from Mike Lekas.

1989 FEB -6 AM 9:00
U.S. DEPT. OF INTERIOR
BUREAU OF LAND MGMT.

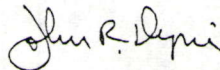
Randy Heuscher
February 3, 1989

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We may need some help in entering data into the computer. If so, I may ask you for some typing support at your end. No special skills or training is required to do this work. The data can be sent by modem or floppy disk to Denver. The drafting will be done on the computer here, but we might ask you for some drafting support if we run into any snags. A mylar base map of the study area has already been prepared.

We are looking forward to working with you on this project. If you have any questions, or need further clarification of the enclosed proposal, please call me.

Sincerely yours,

A handwritten signature in dark ink, appearing to read "John R. Dyni". The signature is fluid and cursive, with the first name "John" being more prominent.

John R. Dyni, Geologist

MINIDISK 12: PROPOSAL.LTR

February 1989 -6 AM 9:00

PROPOSAL TO EVALUATE OIL-SHALE RESOURCES IN EASTERN UINTA BASIN.

INTRODUCTION

At the request of the Utah State Office of the U.S. Bureau of Land Management, the U.S. Geological Survey was asked to prepare a proposal to determine oil-shale resources in an area of approximately 1,400 square miles in the eastern part of the Uinta Basin, Utah, and to determine the degree of reliability of resource estimates for the area. The study would be used by BLM and the State of Utah in support of a proposed exchange of selected state lands for the Federal Ua-Ub oil-shale tract located a few miles south of Bonanza, Utah.

A meeting to discuss the proposed work was held at Salt Lake City, Utah on December 19, 1988 and was attended by John R. Dyni and John R. Donnell of the Branch of Sedimentary Processes. Mr. Dyni is the Associate Coordinator of the Survey's Oil Shale Program and Mr. Donnell was the former Chief of the Oil Shale Program, now retired. In concurrence with Mr. Walter Dean, Chief, Branch of Sedimentary Processes, Mr. Dyni has prepared this proposal which outlines the work that is deemed necessary to make an evaluation of the oil-shale resources of the study area.

AREA OF STUDY

The area of study includes a rectangular area that includes approximately Townships 7 to 13 South, Ranges 20 to 25 East (Salt Lake Meridian) in the eastern part of the Uinta Basin, Uintah County, Utah. The area is about 40 miles long in a north-south direction, and about 33 miles wide in an east-west direction.

The Federal Ua-Ub lands are in the eastern part of the study area and include a block of 10,240 acres in parts of Township 10 South, Ranges 24 and 25 East. As many as 27 core holes have been drilled on and near the tract and many sample have been analyzed by Fischer assay. Therefore, reasonably accurate estimates of the oil-shale resources of the Ua-Ub lands can be made. Only part of the geologic data are on file with the Geological Survey. However, the information is available through the Vernal office of the BLM.

The state lands, mostly in tracts of approximately 640 acres (sections), or smaller, are scattered throughout the study area. Many of the state tracts lie to the south and southwest of the Ua-Ub tract. Few of these tracts have been core drilled for oil-shale evaluation.

For most state lands, oil shale resource estimates must be interpolated from scattered core holes and from oil and gas test wells that were drilled 1 to 4 five miles away from individual tracts. In some cases it will be necessary to make resource estimates indirectly from density and sonic logs of oil and gas wells. It will be important to determine the degree of reliability that can be placed on such data.

GEOLOGIC SETTING

The study area is located in the eastern part of the Uinta Basin, a large sedimentary-structural basin that formed during Late Cretaceous and Tertiary time. Fossil energy resources in the study area include oil shale, oil and gas, coal, and gilsonite.

The study area is underlain by the Eocene Green River Formation which contains sizable deposits of oil shale that have potential economic value for synthetic fuel production. The Mahogany zone contains the most valuable beds of oil shale in the study area and lies at depths ranging from 0 along the south side of the study area to as much as 4000 feet in the northwest corner of the area. The Mahogany zone dips from its outcrop along the southern margin northward toward the depositional axis of the Uinta Basin at an average rate of about 200 feet per mile.

The Mahogany zone is distributed throughout the Uinta Basin and underlies most of the study area. The Mahogany zone contains the richest and thickest sequence of oil shale in the study area. This sequence reaches 80 feet in thickness and may average as much as 30 gallons of shale oil per ton in the northern part of the study area but thins and decreases in grade southward across the area. A number of key beds, such as the Mahogany bed and other unnamed oil-shale beds can be recognized in many wells. Certain key beds of volcanic tuff such as the Mahogany marker and the Fred and Curly beds can be recognized in many core holes.

Oil shales occur above and below the Mahogany zone but are of lower grade than those in the Mahogany zone. Such sequences may range up to 25-30 feet in thickness and average as much as 20 gallons of shale oil per ton. Although these beds constitute a low-grade resource of oil shale, they shall not be evaluated.

RESOURCE INFORMATION

Many core holes have been drilled for oil shale evaluation in the study area. Many additional wells in the study area have been drilled for oil and gas. Fischer assays are available on many of the core holes as well as some geophysical and lithologic logs. Geophysical logs, well-cutting descriptions, and some Fischer assays on rotary cuttings are available for some of the oil and gas wells. Because the oil- and gas-bearing strata are at depths greater than the oil-shale deposits, the quality of the logs through the oil-shale sequence could be less than those logs

that were run in the holes drilled specifically for oil-shale assessment.

The Geological Survey has some but not all of the Fischer assay data for the drill holes in the study area. Fischer assays and geophysical and lithologic logs for some of the drill holes will need to be acquired from the BLM, the State of Utah, or from commercial vendors. Only oil-shale resources of the Mahogany zone shall be investigated. Oil and gas, coal, and other mineral commodities will not be covered by this study, except those that might be associated specifically with the oil-shale deposits; i.e., nahcolite, etc.

OBJECTIVES AND PLAN OF STUDY

The objectives of this investigation are (a) to evaluate the oil-shale resources of state and federal lands in the study area, (b) to estimate the degree of reliability of the resource data that are determined indirectly from geophysical logs in those areas for which Fischer assay data are lacking, and (c) to determine the confidence limits for the resource estimates made for the state and federal lands in the study area.

An outline of the work to be accomplished follows:

1. Prepare a series of detailed stratigraphic cross sections of the Mahogany zone in the study area based on bar graphs of shale-oil yields from Fischer assay data. Stratigraphic correlation lines of key beds in the Mahogany zone shall be shown. Low-grade oil shale (20 gals/ton) above and below the Mahogany zone will not be evaluated. The calculated sequence of oil shale that averages 25 gallons of equivalent oil per ton shall be indicated for each core drill hole on the cross section.
2. Prepare a stratigraphic cross section drawn approximately from north to south through the study area to show significant lithologic details of the Mahogany zone that may affect the shale-oil content of the zone. Those features (i.e., vuggy zones and nahcolite) which may affect the reliability of density and sonic logs shall be investigated.
3. Determine the quantitative relationship between density logs and Fischer assays for a selected group of core holes in the study area and evaluate the degree of reliability of the data for use in calculating oil-shale resources in those parts of the study area where Fischer assay data are not available. This information will also be incorporated into item 4 below.
4. Using kriging techniques, prepare a map of the study area with contours showing equivalent barrels of shale oil per acre. An estimate of reliability of the resource data shall be shown in either tables or diagams.

5. Prepare a map showing contours drawn on the calculated thickness of oil shale that averages 25 gallons per ton in the study area

6. Using USGS Map MF-1311, prepare an overburden and structure map on the Mahogany Bed for the study area.

7. The above cross sections and maps will be included in an administrative report summarizing the resource data for the study area.

PERSONNEL ASSIGNMENTS AND RESPONSIBILITIES

The areas of responsibility are as follows:

John R. Dyni shall serve as project chief. He shall be in charge of the project and well as be responsible for the timely completion of the project work and the final administrative report for the BLM.

W.R. Grundy shall be responsible for the determination of the estimated shale-oil resources of Federal and state lands in the study area and for the determination of the degree of reliability of the estimated resources in the area.

J.R. Donnell shall be responsible for the preparation of a series of stratigraphic cross sections and help in the preparation of resource and structure maps of the study area.

W.B. Cashion shall assist by providing geologic data for the study area and he shall prepare a north-south lithologic cross section of the Mahogany zone through the study area.

C. Williamson shall assist the other geologists by digitizing density and sonic logs of selected wells and prepare computer-drawn bar graphs, cross sections, and a base map of the study area.

ESTIMATED PROJECT COSTS

The estimated costs for this project are divided into computer needs and salaries and consulting fees for those individuals who shall be working on the project, and basemap materials. Some computer equipment and software are anticipated to complete the project in a timely manner. Because the Geological Survey has recently moved its oil-shale database from a mainframe to the PC computer, it will be necessary to do most of the computer work on a PC-based computer.

The costs for computer software and equipment are estimated as follows:

A. Computer equipment and software:

Software:

1. MINITAB for PC computer	\$ 695
2. IBM DOS 4.0	100
3. Microsoft WINDOWS	126

Equipment for IBM Model 80/111 computer

4. External Bernoulli 5¼-in. 20-MB dual drive	1,962
5. Math coprocessor chip	550
6. IBM Model 8513 color monitor with controller	872
7. Internal 2400 baud modem	271
8. 3½-inch 1.44 MB floppy drive	179

Subtotal	4,755

B. Base map materials and

geophysical logs

Subtotal \$ 500

The salaries and consulting fees as outlined below are based on the anticipation of having to make a complete shale-oil resource evaluation of the Federal Ua-Ub oil-shale lease tract. Because of the large number of core holes that have been drilled on the tract, additional time was allowed in this proposal to cover the cost of making this evaluation. If it is determined that information on the shale-oil resources for the Ua-Ub tract is available and is found to be adequate for use in this study, the time to complete the project may be reduced with some savings in salaries and consulting fees. It is recommended that the BLM make separate arrangements to pay the two consultants, otherwise, it will be necessary to charge an additional 18 percent for overhead for these people. The overhead that is shown below does not include the consultants. Some travel may be required by one or more of the project personnel. No travel costs are estimated in this proposal since it would be expected that the BLM could pay for these expenses as they arose by journal voucher.

C. Personnel and salaries

U.S. Geological Survey employees:

J. R. Dyni (Project Chief)	5 pay periods	\$ 12,665
W. D. Grundy, Geologist	4 pay periods	10,220
C. Williamson, Geologist	4 pay periods	4,668

FTE agency charge	5,000
18% agency overhead charge	8,299

Subtotal 46,107

Consultants:

J. R. Donnell, Geologist	3 weeks @ \$40/hr	4,800
W. B. Cashion, Geologist	4 days @ \$40/hr	1,600

Subtotal \$ 6,400

Grand total \$ 52,507

NOTES ON THE GEOLOGY OF THE STUDY AREA

Fischer assay and density logs for two core holes in the study area were reviewed to see if the density logs could be used in an oil shale appraisal. The two core holes selected are U044 (USGS core hole Coyote Wash No. 1 in sec. 22, T.9 S., R.23 E. and U045 (USGS Red Wash No. 1 in sec. 1, T.9 S., R.22 E.). The digitized density logs, Fischer assay profiles, and the scatter plots of the density and Fischer assay data for the two holes are shown on figs. 1-6.

A high degree of statistical correlation was found between the density log and shale-oil yield for both holes (R-squared values were 82.4 and 90.1 percent). Profiles of the density log and Fischer assays correlated bed for bed through much of the Mahogany zone in both wells. A few anomalous low-density zones that assayed much lower than expected from the density log were noted in several places. These may indicate cavities in the strata that were once filled with nahcolite. These preliminary results suggest that geophysical logs can be successfully used for estimating shale-oil yields. Furthermore, it may be possible to identify cavities on the caliper log so that more accurate estimates of shale-oil yield can be made.

Three-dimensional models of the thickness and grade of the "mining zone" as picked by M. Lekas are shown in figs. 7 and 8. Similar models shall be prepared during the course of the project to evaluate the oil-shale resources in the study area.

U044 density log

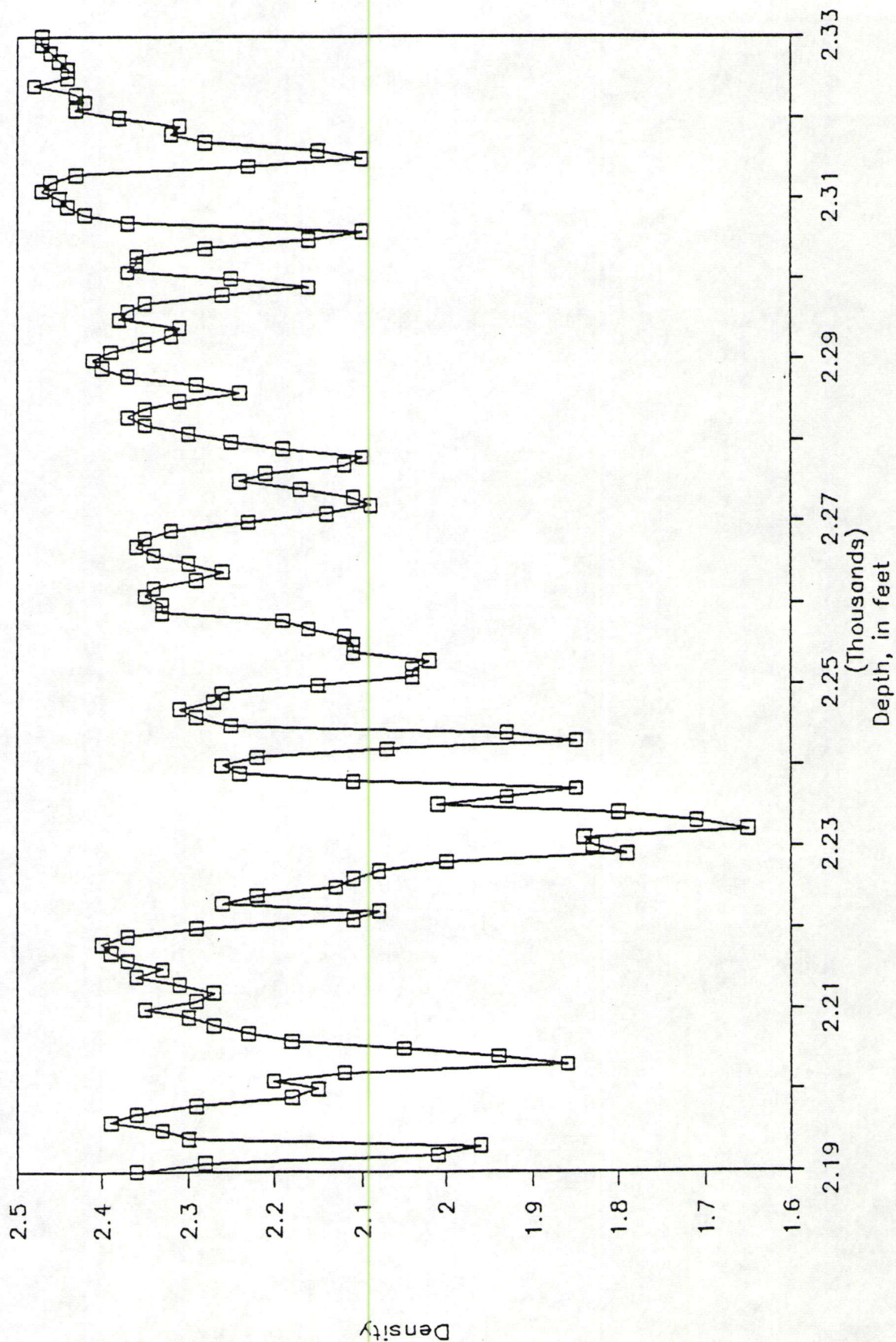


Figure 1-- U044 density log
(digitized)

COREHOLE U044

Fischer assay

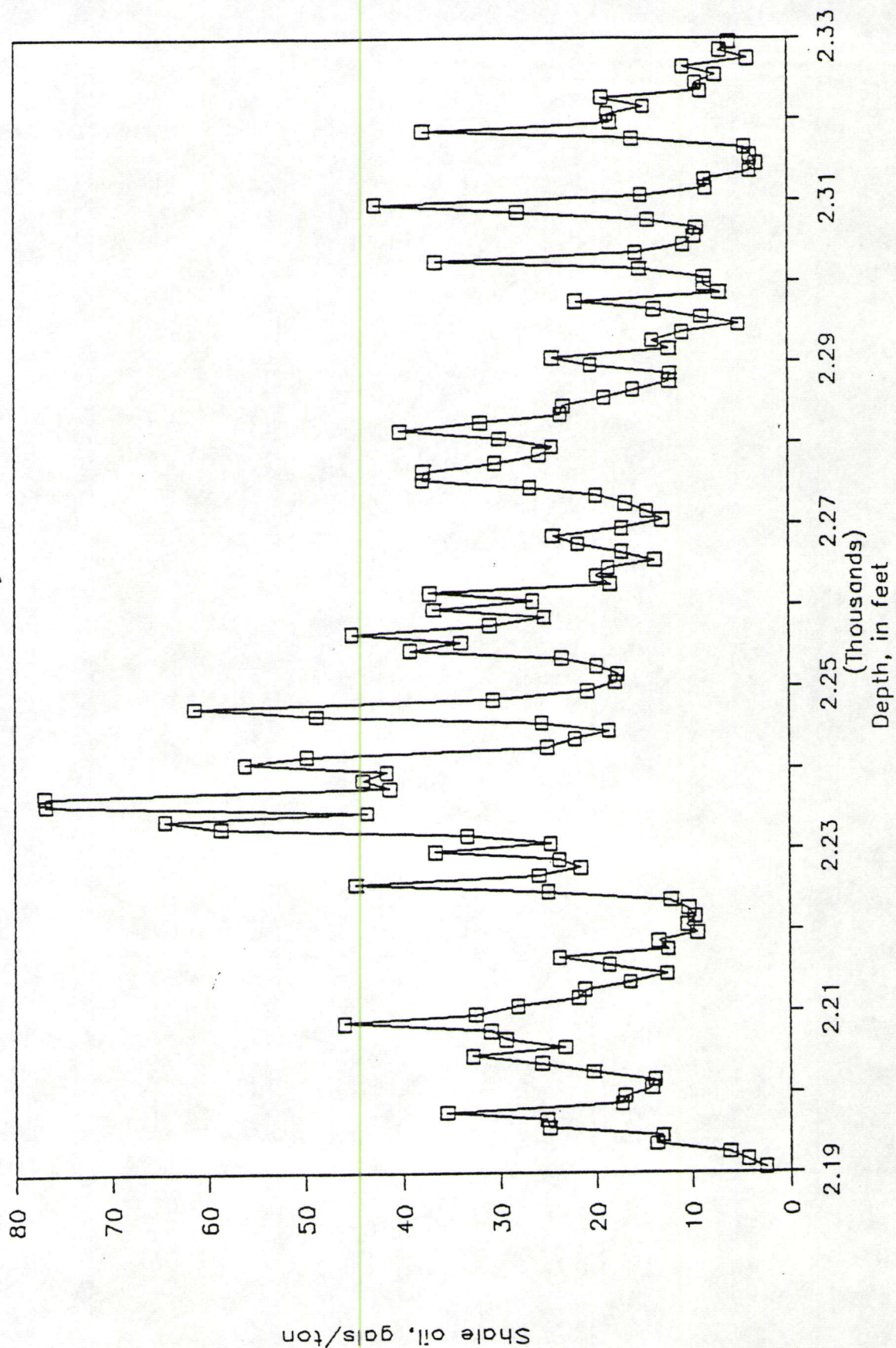


Figure 2 -- Fischer assay profile for U044

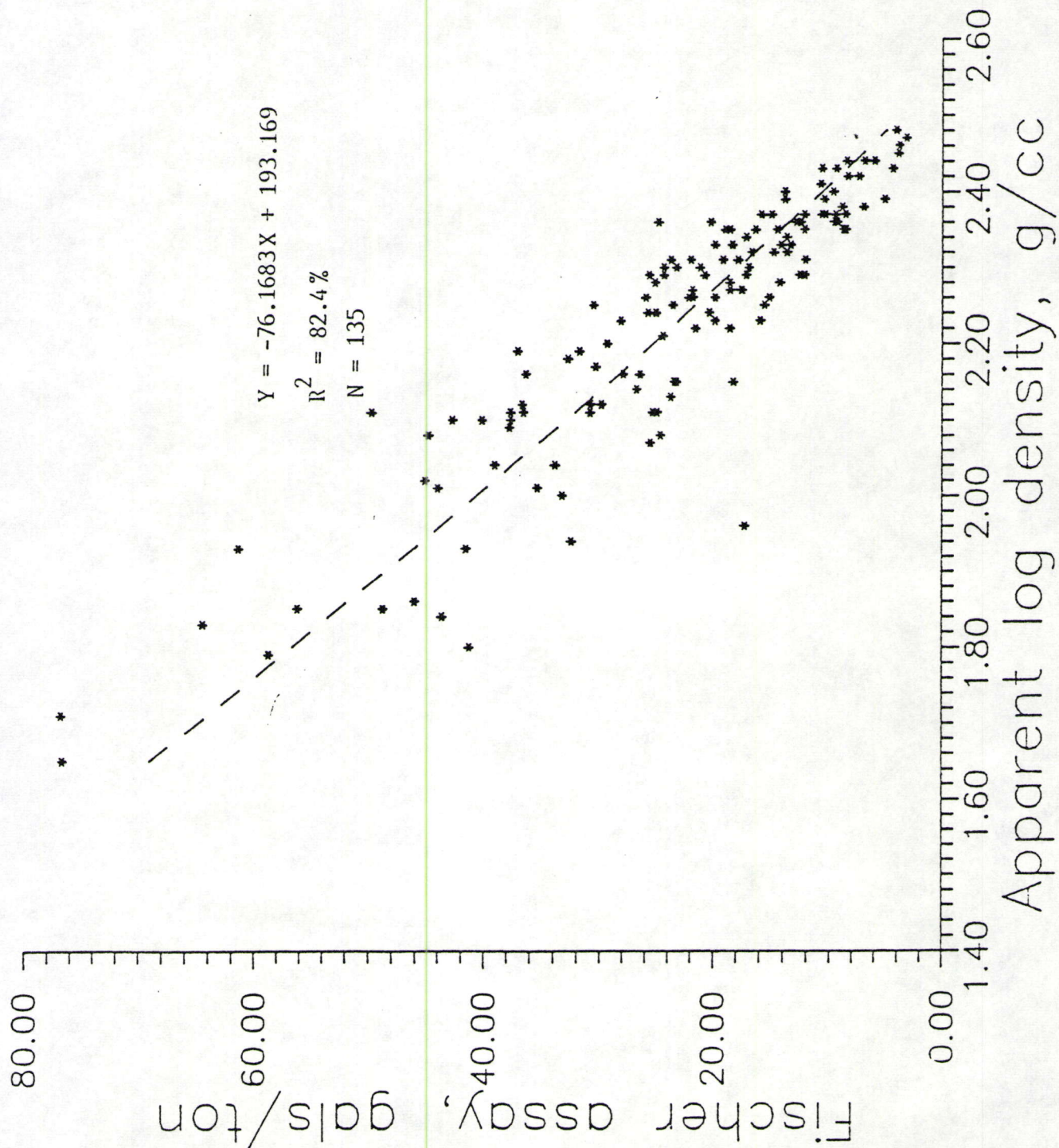


Figure 3 -- Correlation of Fischer assays and digitized density data for U044

Corehole U045

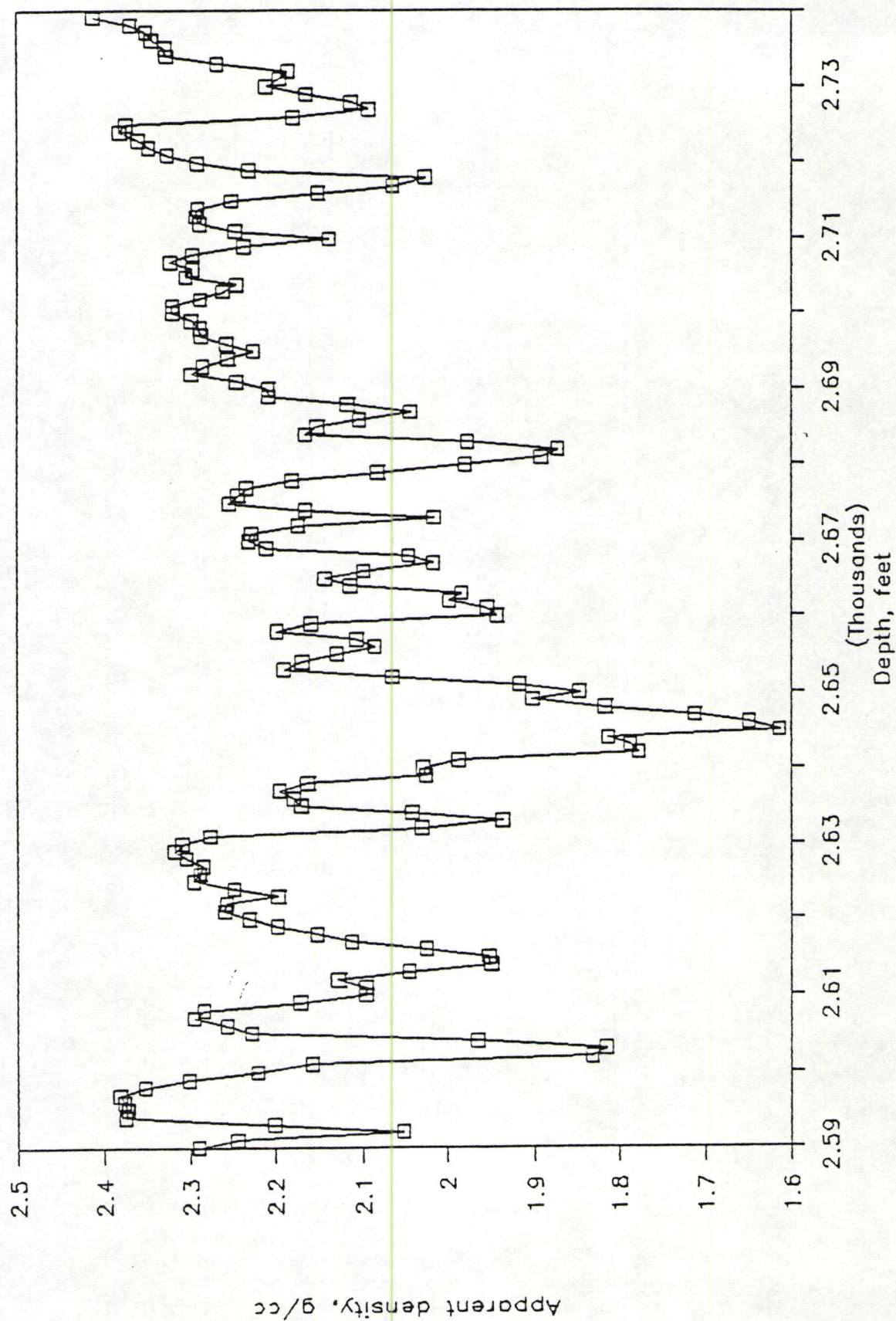


Figure 4 -- Digitized density log for U045

Corehole U045

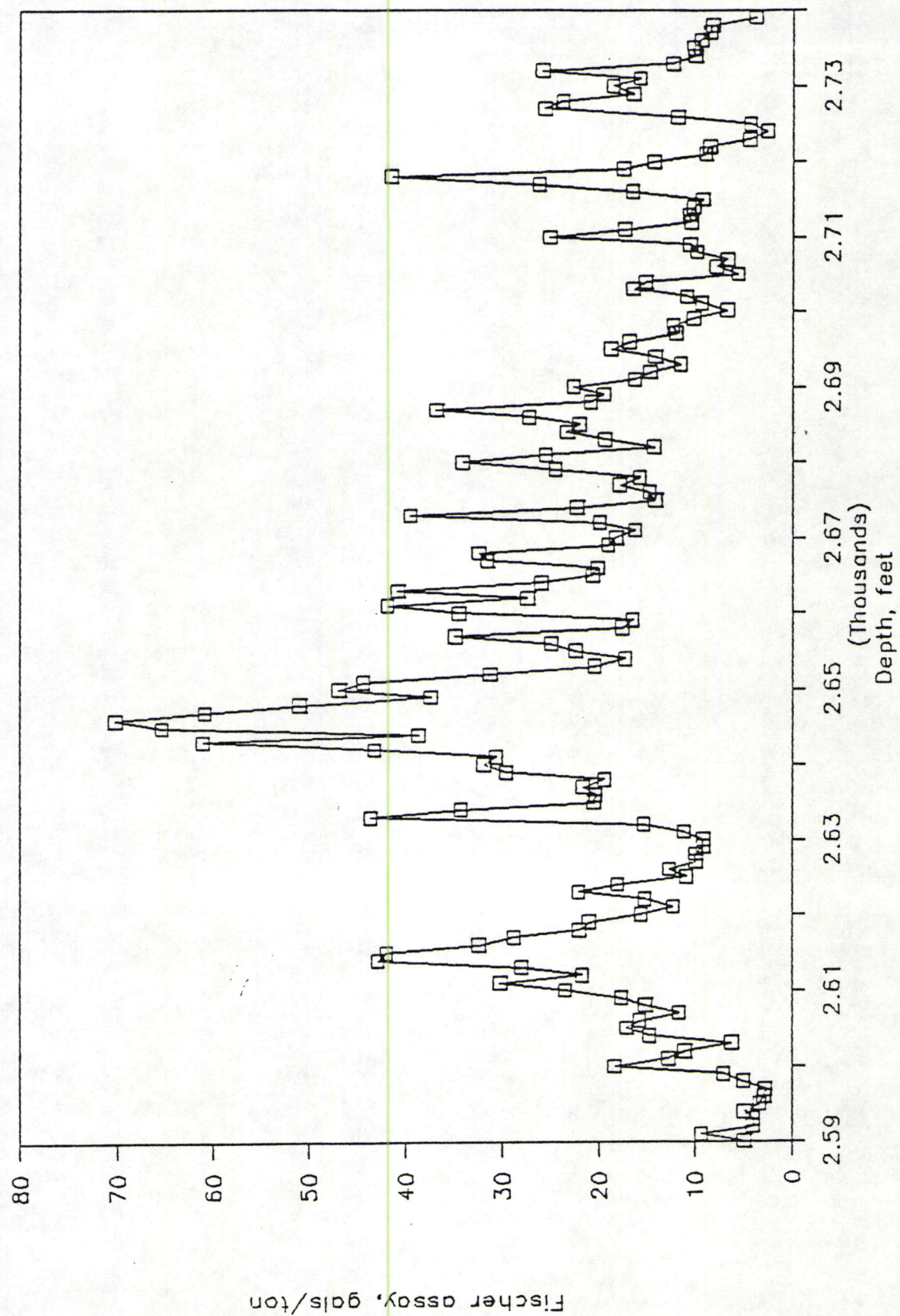


Figure 5-- Fischer assay profile for U045

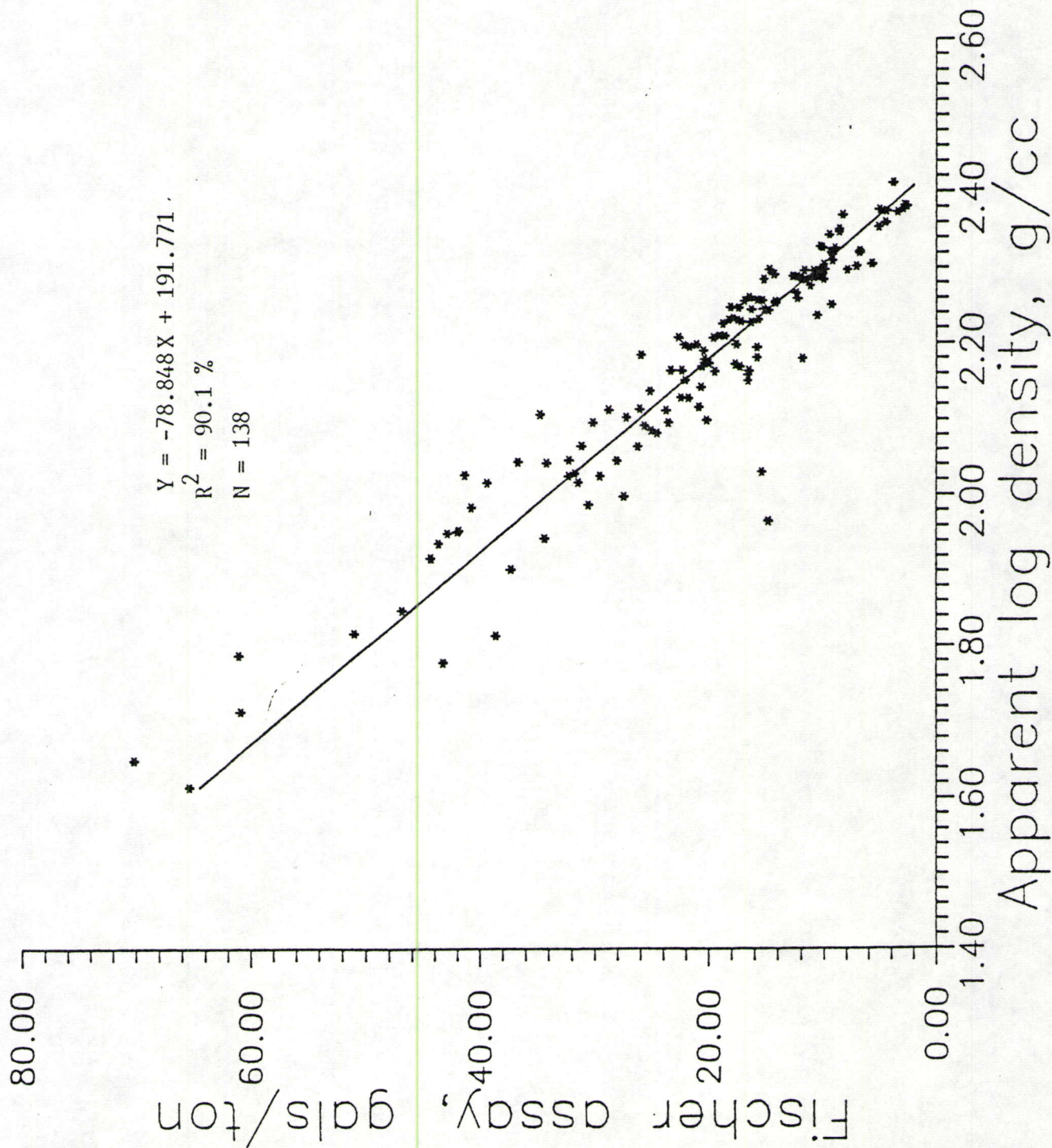
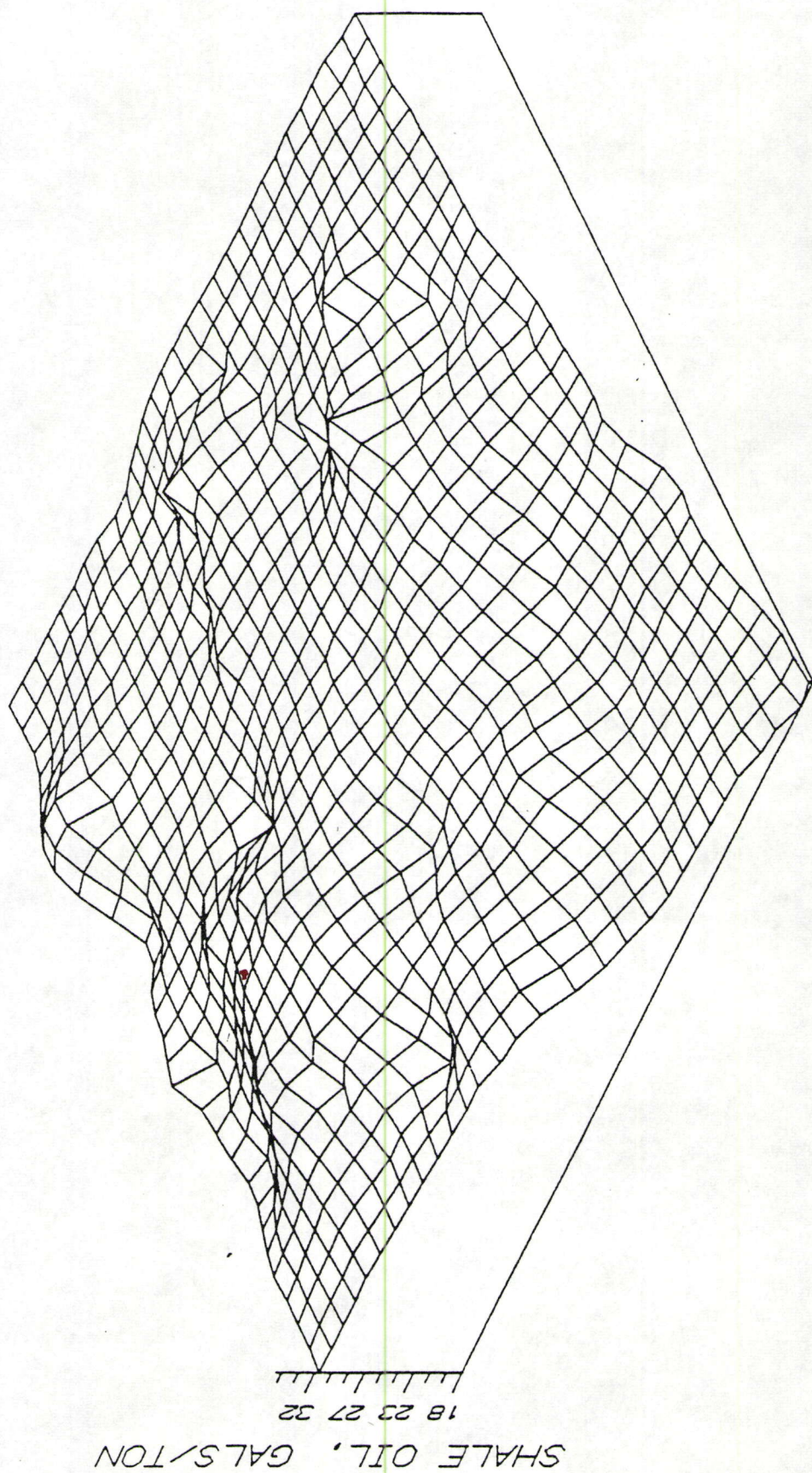


Figure 6 -- Correlation of Fischer assays and digitized density data for U045



GRADE OF MINING ZONE

Figure 7 -- Grade of Lekas' mining zone for study area

